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ABSTRACT

Intended for the vocational instructor, the booklet presents a task list and competency record for an exploratory program in auto mechanics. The list was developed by a working committee of auto mechanics instructors and industry representatives throughout the state of Minnesota for use in program articulation between secondary and postsecondary institutions. Identical to the task list for the occupational program of automotive mechanic, groups of tasks are organized into 12 areas of competence: Steering and Suspension System, Drive Train, Engine Mechanical, Cooling and Heating System, Air Conditioning, Brake, Electrical, Engine Tune-Up, Fuel and Emission System, Body Adjustments, Exhaust and Lubrication, and Related Subject Activities. It is recommended that some tasks within each of the 12 areas of competence be selected for developing an exploratory program in auto mechanics. The competency record is a suggested replacement for the traditional report card and would accompany the student through his or her vocational training in the secondary and/or postsecondary school. For each group of tasks within the competency areas, the student is graded for his competency in task performance on a 6-point scale ranging from "received introduction only" to "able to help others; very competent." Also included in the booklet are a list of references and blank pages for notes. (Author/RG)

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EXPLORATORY PROGRAM FOR AUTO MECHANICS

task list and competency record

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I. DESCRIPTION OF THE PROGRAM

The purpose of the articulation effort is to allow a student access to an educational program which provides continuity between two or more levels of education. A well articulated program will allow a student to complete occupational training more quickly or less expensively because the unnecessary repetition of learning experiences is removed.

The task list that follows is the entire listing of tasks which was developed for the general automotive mechanic. It is recommended that instructors from the secondary and post secondary schools, that are articulating curricula, identify <u>first</u> some tasks within <u>each</u> of the twelve areas of competence shown on this task list. As a group, choose the tasks that are the most important for all students to explore -- so that they can make realistic and informed choices as to whether or not they wish to enter an auto mechanics occupation.

Additional training will be needed by students who, upon finishing this exploratory program that you are about to develop, decide to enter an auto mechanics occupation.

Students who have completed the exploratory program and who have decided to continue in auto mechanics may wish to enter an occupational program such as lubrication specialist, service center mechanic or automotive mechanic.

A student who has finished the exploratory program and has decided <u>not</u> to continue in auto mechanics should have had the opportunity to gain leisure time skills for his or her own personal use.

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TASK LIST

AREA OF COMPETENCE #1

PERFORM STEERING AND SUSPENSION SYSTEM SERVICE

IA. Inspect Steering and Suspension System
1. Inspect springs for breakage and sag
   a. Coil
   b. Leaf
   c. Torsion Bar
2. Inspect shock absorber for leaks, operation, and mounting
   a. Standard
   b. Air
3. Inspect control arm bushings for distortion and wear
4. Check ball joints for wear and lubrication
5. Check spindles and steering knuckles for bent parts and worn parts
6. Inspect tires and wheels for wear pattern
   a. Air pressure
   b. Proper size
7. Inspect wheel bearings for noise and condition
8. Inspect tie rods for looseness, seals, and bent rods
9. Inspect idler arms for worn bushings
10. Inspect stabilizer bars for breakage and bushing wear
11. Inspect steering arms for damage
12. Inspect drag links for damage and loose ends
13. Inspect bell-crank assemblies for damage and wear
14. Inspect rear-axle housing for damage, broken welds, bushings, and leaks
15. Inspect frame and body for bends, cracks, damage, and height
16. Inspect sway bars for bushing wear
17. Inspect strut bars for bushing wear
18. Inspect solid-beam axles for damage and bushing wear
19. Inspect trailing and torque arm for distortion
20. Inspect trunnions for looseness
21. Check torsion bar height
22. Inspect front wheel drive/steering axle for worn parts

IIA. Remove and Replace Steering and Suspension Components
1. R/R springs and adjust
   a. Coil
   b. Leaf
   c. Torsion Bar
2. R/R shock absorbers
   a. Standard shock components
   b. Air shock components
3. R/R control arm
4. R/R ball joints

5. R/R spindles and steering knuckles
6. Mount and demount tires. Use tire changing machine
   a. Repair tires
7. R/R wheel bearings, pack and adjust
   a. Replace seals
8. R/R tie rods and check toe-in
9. R/R idler arm and adjust
10. R/R stabilizer bars
11. R/R steering arms
12. R/R drag links and adjust
13. R/R bell-crank assemblies
14. R/R rear-axle housing
15. Align and weld frame and body
16. R/R sway bars and bushings
17. R/R strut bars and bushings
18. R/R solid-beam axles or correct
19. R/R trailing and torque arms or correct
20. R/R trunnions
21. R/R torsion bars and adjust
22. Check and adjust alignment angles
    a. Height
    b. Caster
    c. Camber
    d. Toe-in
    e. Turning radius
    f. Steering axis inclination
    g. Tracking
23. Perform static and dynamic balancing
    a. Tire and wheel correction
24. Perform lubrication service
25. Perform safety inspection

IIIA. Diagnose Steering and Suspension System
1. Diagnose problems
   a. Control
   b. Noise
   c. Vibration
   d. Wander
   e. Pull
   f. Turning
   g. Recovery
   h. Hard steering
2. Diagnose tire wear pattern

IB. Inspect Manual and Power Steering System
1. Inspect fluid levels and leak
2. Inspect gearbox for lash, mounting, and seals

3. Inspect pump for mounting, lines, seals, hoses, n·.se, pulley, and belts
4. Inspect steering column damage and wear

IIB. Remove and Replace Manual and Power Steering System Components
1. R/R belts, hoses, and lines
2. R/R seals
3. R/R pump, gearbox, and related components
4. R/R steering wheel
5. R/R steering column and components

IIIB. Rebuild Manual and Power Steering Components
1. Rebuild and adjust manual steering gear
2. Rebuild and adjust power steering gear box
3. Rebuild and adjust power steering pump
4. Rebuild steering column

IVB. Diagnose Manual and Power Steering System
1. Check and adjust lash adjustments
2. Test system pressures
3. Check and correct leaks and noises
4. Diagnose turning problems
5. Diagnose steering column problems

AREA OF COMPETENCE #2

PERFORM DRIVE TRAIN SERVICE

IA. Inspect Clutch Assembly
1. Inspect clutch operation
2. Inspect pedal free play
3. Inspect noises
   a. Release and pilot bearing
   b. Other component noises
4. Inspect engine and transmission mounts
5. Inspect linkage
   a. Mechanical
   b. Hydraulic

IIA. Remove and Replace Clutch Components
1. R/R clutch disc and pressure plate
2. R/R release and pilot bearing
   a. Flywheel
   b. Surface condition and ring gear
   c. Measure run-out
   d. Measure pilot bearing wear
3. Inspect and R/R linkage, collar, release hub, and fork
4. R/R hydraulic components
5. Adjust free play and total travel

IIIA. Rebuild Clutch Components

1. Machine flywheel
2. Rebuild hydraulic components

IVA. Diagnose Clutch Operation
1. Diagnose slipping clutch
2. Diagnose chatter and noises
3. Diagnose vibration
4. Diagnose drag (improper release)

IB. Inspect Manual Transmission Assembly
1. Inspect fluid levels and leaks
2. Inspect linkage and mounting
3. Inspect operation and noises

IIB. Remove and Replace Manual Transmission Components
1. Remove and install transmission (3,4, and 5 speed)
2. Measure bell housing run-out
3. R/R linkage and adjust
4. Inspect and lubricate speedometer cable

IIIB. Rebuild Manual Transmission
1. Rebuild manual transmissic (3,4, and 5 speed)
2. Rebuild planetary overdrive assembly

IVB. Diagnose Manual Transmission Operation
1. Diagnose transmission problems
   a. Noise
   b. Shift quality
   c. Slipping out of gear
   d. Leaks
2. Diagnose planetary overdrive problems
   a. Electrical
   b. Mechanical

IC. Inspect Automatic Transmission Assembly
1. Inspect fluid levels, leaks, and conditions
2. Inspect operation
   a. Perform basic road test
3. Inspect linkage and mountings
4. Inspect lines and hoses

IIC. Remove and Replace Automatic Transmission/Components
1. Drain fluid and replace filter
2. Adjust band and linkage
3. R/R linkage
4. R/R vacuum modulator
5. Inspect and lubricate speedometer cable
6. Remove and install transmission
7. R/R front/rear seal and bushings
8. Service converter
9. Install auxillary cooler

IIIC. Rebuild Automatic Transmissions
1. Rebuild 2 and 3 speed transmissions

IVC. Diagnose Automatic Transmission Operation
1. Perform pressure tests
2. Diagnose transmission problems
   a. Slipping
   b. Harsh shift
   c. Erratic shift
   d. Shift points
   e. Down shifts
   f. No Park
   g. Noise
   h. Overheating

i. Converter
j. Sprag clutches
3. Perform road test
4. Perform dynamometer test

ID. Inspect Drive Shaft Components
1. Inspect drive shaft condition
2. Inspect universal joints for wear
3. Inspect center bearing for condition
4. Inspect constant velocity joint
5. Lubricate components

IID. Remove and Replace Drive Shaft Components
1. R/R drive shaft
a. Open (hotchkiss)
b. Closed (torque tube)
2. R/R universal joints
3. R/R center bearing
4. R/R constant velocity joint
5. R/R yoke, seal, and bushing
6. Measure drive shaft angle, run-out, and adjust

IIID. Diagnose Drive Shaft Operation
1. Diagnose component problems
a. Vibration
b. Noise
c. Run-out
d. Balance

IE. Inspect Drive Axle Assemblies
1. Inspect fluid levels and leaks
a. Rear axle assembly
b. Front axle assembly
c. Four wheel drive
d. Transfer case
2. Inspect mounting and noises
3. Inspect noises

IIE. Remove and Replace Drive Axle Components
1. R/R rear axle assembly
a. Housing
b. Carrier assembly
2. R/R front axle assembly
3. R/R transfer case

IIIE. Rebuild Drive Axle Components
1. Rebuild rear axle assembly
a. Standard
b. Limited slip
2. Rebuild front axle assembly
3. Rebuild transfer case

IVE. Diagnose Drive Axle Operation
1. Diagnose drive axle noises
a. Bearings
b. Gears
c. Back-lash
2. Diagnose bent housing
3. Diagnose bent axles
4. Diagnose limited slip operation
5. Diagnose transfer case operation

AREA OF COMPETENCE #3

PERFORM ENGINE MECHANICAL SERVICE

IA. Inspect Engine Condition
- 1. Inspect fluid levels and leaks
- 2. Check performance and condition
  - a. Check abnormal noises, smoke, and roughness
  - b. Check for oil deposits in tailpipe, radiator, and air cleaner
  - c. Use infra-red to check engine condition
- 3. Diagnose engine condition
  - a. Check cylinder balance (RPM and vac.)
  - b. Check compression (dry-wet)
  - c. Check cylinder leakage
  - d. Check oil pressure
  - e. Identify specific engine components noises
  - f. Identify engine lack of performance problems
- 4. Determine engine repair procedure required
  - a. Perform valve train service
  - b. Rebuild engine

IIA. Remove, Replace, and Inspect Engine Components
- 1. R/R cylinder head and valve train
- 2. R/R engine assembly
- 3. Install short block assembly
- 4. R/R oil pan and gasket
- 5. R/R oil filter
- 6. R/R oil pump
- 7. R/R vibration damper and front seal
- 8. R/R timing mechanism and cover
- 9. R/R camshaft and bearings
- 10. R/R rear main seal
- 11. R/R expansion plugs
- 12. R/R valley cover and gasket
- 13. R/R rocker arm cover and gaskets
- 14. R/R engine accessories

IIIA. Rebuild, Measure, Assemble, and Adjust Engine Components
- 1. Rebuild cylinder head assembly
  - a. Inspect for cracks and worn guides
  - b. Service valves and seats
  - c. Service guides
  - d. Service rocker arm assemblies
- 2. Rebuild cylinder block assembly
  - a. Install camshaft bearings
  - b. Install gallery plugs and core plugs
  - c. Install crankshaft bearings
  - d. Install seals and gaskets
  - e. Assemble piston and rod assembly

f. Assemble timing mechanisms
g. Inspect rod and main bearing bores for stretch

IVA. Perform Final Inspection and Break-In Procedure
1. Inspect fluid leaks and oil pressure
2. Check noise levels
3. Perform adjustments
a. Adjust carburetor
b. Adjust belts
c. Adjust linkage
d. Adjust dwell and timing
e. Adjust fluid levels
f. Test radiator cap
4. Perform road test for engine performance
5. Perform dynamometer test for engine performance

AREA OF COMPETENCE #4

PERFORM COOLING AND HEATING SYSTEM SERVICE

IA. Inspect Cooling and Heating Systems
1. Inspect and test pressure cap
2. Pressure test cooling system
3. Inspect and test combustion leakage
   a. Use pressure test, fluid gas detector, and infra-red testers
4. Inspect, test, and add coolant
5. Inspect system for leaks
6. Inspect and replace hoses
7. Inspect, replace, and adjust fan belt with tension gauge
8. Inspect radiators, flush, and replace coolant
9. Inspect, test, and replace thermostat and by-pass valves
10. Inspect operation of cooling system block and tank heaters
11. Inspect air-cooled engine cooling systems
12. Inspect and test operation of blower motor, speed controls, and air temperature
13. Inspect radiator for obstructions and clean exterior components
14. Inspect operation of semi-sealed and recovery systems
15. Inspect water pump for bearing condition and water leaks
16. Inspect thermostatic fan for condition of blades, hub, and mounts
17. Test operation of heater control valves for air and water with vac. gauge
18. Inspect automatic transmission fluid coolers
    a. Inspect radiator for contamination with fluid
    b. Inspect transmission for contamination with coolant
19. Inspect warning light system
20. Reverse flush heater core

IIA. Remove and Replace Cooling and Heating System Components
1. R/R radiator
2. R/R core plugs
3. R/R water pump
4. R/R fan and thermostatic clutches
5. Perform minor repairs on soldered parts
6. R/R blower motor and controls
7. R/R heater core

IIIA. Diagnose Cooling and Heating System
1. Diagnose engine overheating
2. Diagnose coolant contamination or loss
3. Diagnose heater problems (electric and vacuum)
4. Diagnose warning circuitry
5. Diagnose heater lack of heat

AREA OF COMPETENCE #5

SERVICE AIR CONDITIONING SYSTEM

IA. Inspect Air Conditioning System
1. Inspect air conditioning system for proper operation and mounting
2. Inspect refrigerant level by sight glass
3. Inspect clutch operation and belt condition
4. Locate and replace burned fuses
5. Clean and straighten condenser fins
6. Test duct discharge temperature
7. Test blower and control operation (electric and vacuum)
8. Inspect components and lines for oil seepage
9. Inspect and clean evaporator water drain

IIA. Remove and Replace Air Conditioning Components
1. Test pressure of system
2. Test system for leaks
3. Discharge system
4. Inspect oil level, add or replace oil
5. R/R compressor clutch
6. R/R compressor seal
7. R/R hoses, lines, and components
8. Evacuate and charge system
9. Inspect and test for function of all electrical and vacuum controls
10. Performance test system
11. Install air conditioner in vehicle

IIIA. Rebuild Air Conditioning Components
1. Rebuild clutch
   a. Replace bearings
   b. Replace windings
2. Rebuild compressor
   a. Replace front seal
   b. Replace seals and gaskets
   c. Replace reed plates
   d. Replace bearing
   e. Rebuild internal components
3. Perform minor solder/welding repairs

IVA. Diagnose Air Conditioning System
1. Diagnose refrigeration problems
2. Diagnose control problems
   a. Electrical
   b. Vacuum
   c. Mechanical
3. Diagnose mechanical problems
4. Diagnose automatic temperature systems

AREA OF COMPETENCE #6

PERFORM BRAKE SERVICE

IA. Inspect Drum/Disc Brake System
1. Check operation of brake system
2. Inspect drums/disc.
3. Inspect linings or pads
4. Inspect brake hardware
   a. Springs
   b. Holddowns
   c. Adjusters
   d. Backing plate
   e. Anchors
   f. Parking brake
5. Inspect hydraulic system
   a. Wheel cylinders/calipers
   b. Master cylinder
   c. Lines/hoses
   d. Control valves
6. Inspect wheel bearings and seals
7. Inspect brake pedal rod, mounting, linkage, and free travel
8. Inspect operation of brake booster
9. Inspect operation of stoplight and brake warning light

IIA. Remove and Replace Brake System Components
1. R/R brake shoes/pads and brake hardware
2. R/R hoses, lines, and double flare steel tubing
   a. Form steel line to proper routing
3. R/R master cylinder
4. R/R brake vacuum booster
5. R/R caliper and wheel cylinder
6. R/R bleeder screw
7. R/R rear axle bearing and seal
8. Bleed air from system with manual and pressure bleeder
   a. Flush system with brake fluid
9. Check and adjust pushrod
10. R/R parking brake components and adjust
11. R/R, repack, and adjust bearings
12. Torque wheel lug nuts

IIIA. Rebuild and Machine Brake Components
1. Machine brake drum
2. Machine disc.
3. Rebuild caliper assembly
4. Remove and replace rivet lining
5. Arc lining to drum for proper toe and heel clearance
6. Rebuild wheel cylinder
7. Rebuild master cylinder
8. Rebuild power brake unit

IVA. Diagnose Drum/Disc Brake System

1. Diagnose brake noises
2. Diagnose abnormal pedal position and action
3. Diagnose dragging brakes, including parking brake drag
4. Diagnose brake fade, erratic brakes, pull, drive, and grab
5. Diagnose tire and suspension related problems
6. Diagnose hydraulic system--valves, controls, and leaks
7. Diagnose brake warning system
8. Diagnose power brake unit
   a. Vacuum system type
   b. Hydraulic pressure system type
9. Perform road test for performance of brake system
10. Perform dynamic test for performance of brake system
11. Diagnose anti-skid systems

AREA OF COMPETENCE #7

PERFORM ELECTRICAL SERVICE

IA. Inspect and Service Battery
- 1. Inspect battery electrolyte level and refill
- 2. Remove and clean battery terminals and cables
- 3. Test state of charge and determine battery condition
  - a. Use hydrometer
  - b. Use load type testers
- 4. Start vehicle using jumper cables
- 5. Charge battery
  - a. Use fast charger w/thermometer and voltmeter
  - b. Use slow charger
- 6. Inspect carrier and holddown

IIA. Remove and Replace Battery
- 1. Prepare and install battery
  - a. Wet
  - b. Dry
  - c. Maintenance Free
- 2. R/R cables

IIIA. Diagnose Battery Problems
- 1. Diagnose electrical problems
- 2. Diagnose mechanical problems

IB. Inspect Charging Circuit
- 1. Inspect generator/alternator mounts
- 2. Inspect and adjust tension of belts with tension gauge
- 3. Inspect generator/alternator to regulator wiring
- 4. Inspect warning or gauge circuit

IIB. Remove and Replace Charging Circuit Components
- 1. R/R generator/alternator
- 2. R/R regulator
- 3. R/R wiring
- 4. R/R ammeter
- 5. R/R belts and pulleys

IIIB. Rebuild Charging Circuit Components
- 1. Rebuild generator/alternator
  - a. Replace bearings
  - b. Turn commutator or slip rings
  - c. Undercut commutator
  - d. Test and replace components
    - (1) Test stator
    - (2) Test rotor

(3) Test diodes
(4) Test diode trio
(5) Test armature
(6) Test field coils
(7) Test brush holders
e. Replace brushes
2. Test and adjust voltage regulator
3. Test field relay operation
4. Test or repair related wiring and fuse links

IVB. Diagnose Generator/Alternator Charging Circuit
1. Diagnose battery problems
a. Check overcharge battery
b. Check undercharge battery
c. Check excessive use of water
2. Diagnose high, low, and no charge problems
3. Diagnose noises
4. Diagnose alternator or regulator problems
5. Diagnose wiring problems
6. Diagnose indicator light problems

IC. Inspect Cranking System
1. Inspect cranking motor cables and connections
2. Inspect mounting of solenoid
3. Inspect cranking motor mounting bolts
4. Test cranking motor draw and circuit resistance

IIC. Remove and Replace Cranking Circuit Components
1. R/R battery cables
2. R/R cranking motor
3. R/R solenoid or relay
4. R/R control circuit components
5. R/R cranking motor drive and inspect ring gear teeth

IIIC. Rebuild Cranking Circuit Components
1. Rebuild cranking motor assembly
a. Test and replace components
(1) Test armature
(2) Turn armature
(3) Test field coils
b. Replace bushings
c. Replace brushes or holders
d. Replace field coils
e. Replace drive assembly
2. Rebuild solenoid assembly
a. Test winding
b. Service contacts

IVC. Diagnose Cranking Motor Circuit
1. Diagnose cranking motor
   a. Check slow cranking
   b. Check no cranking
   c. Check drive conditions
   d. Check noises
2. Diagnose solenoid or relay problems
3. Diagnose control circuit problems
   a. Test neutral safety switch
   b. Test ignition switch
   c. Test fuse link
4. Check engine related problems

ID. Inspect Ignition System
1. Remove and inspect spark plugs
2. Clean, file, reset, or replace spark plugs
3. Test spark plugs
4. Inspect primary and secondary wiring
5. Inspect distributor cap
6. Inspect rotor
7. Inspect point condition
8. Inspect and clean coil
9. Inspect vacuum advance controls and hoses

IID. Remove and Replace Ignition Circuit Components
1. R/R and check secondary cables
2. R/R distributor cap and rotor
3. R/R and test distributor
4. R/R primary wires
5. R/R points and test condenser
6. R/R and test vacuum advance unit
7. R/R ignition switch and resistor assembly
8. R/R electronic pick-up and control unit
9. R/R and test coil

IIID. Rebuild Ignition Circuit Components
1. Rebuild distributor
   a. Test condenser
   b. Replace bushings
   c. Bench test distributor
   d. Replace and align points
2. Service spark plugs
   a. Test
   b. Clean
   c. File and gap

IVD. Diagnose Ignition Circuit
1. Diagnose primary circuit problems
2. Diagnose secondary circuit problems
3. Diagnose circuit with basic meters
4. Diagnose circuit with oscilloscope and/or infra-red
5. Diagnose and repair electronic ignition system

IE. Inspect Electrical Accessories
1. Inspect wiring and connections of all circuits
2. Inspect operation of windshield wipers and blade condition
3. Inspect wiper motor operation and mounting
4. Inspect operation of washers, clean and aim nozzles
5. Inspect operation of horn
6. Inspect operation of anti-theft buzzer for ignition lock
7. Inspect operation of heated back window
8. Inspect operation of electric power windows
9. Inspect operation of power seats and convertible tops

IIE. Diagnose and Repair Electrical Accessory Circuits
1. Diagnose and repair wiper system
2. Diagnose and repair washer system
3. Diagnose and repair horn circuit
4. Diagnose and repair buzzer circuit
5. Diagnose and repair heated back window
6. Diagnose and repair automatic speed controls
7. Diagnose and repair power window motors
8. Diagnose and repair fuel gauge circuit
9. Diagnose and repair temperature gauge circuit
10. Diagnose and repair oil pressure gauge circuit
11. Diagnose and repair ammeter circuit
12. Diagnose and repair warning light circuits
13. Diagnose and repair electric fuel pumps
14. Diagnose and repair power seat motors
15. Diagnose and replace speedmeter assembly
16. Solder electrical connections

IF. Inspect and Replace Lighting System Components
1. Inspect wiring, connections, and circuit protectors
2. Inspect headlight circuit
3. Inspect turn signal and warning flashers circuit
4. Inspect interior and courtest lamp circuit
5. Inspect stoplamp circuit

III. Diagnose and Repair Lighting Circuits

1. Diagnose and repair headlamp circuit
   a. Conventional
   b. Concealed
   c. Auto dimmer
2. Diagnose and repair turn signal circuit
3. Diagnose and repair interior light circuit
4. Diagnose and repair stop lamp circuit
5. Meet state requirements for Minnesota Headlamp Adjuster License

AREA OF COMPETENCE #8

PERFORM ENGINE TUNE-UP SERVICE

IA. Perform Minor Tune-Up Service
1. Service or replace spark plugs
2. Replace ignition points and condenser
3. Set dwell and ignition timing
4. Set carburetor idle mixture and speed
   a. Free choke assembly and fast idle linkage
5. Service air cleaner element and P.C. valve
6. Service battery and cables
7. Inspect fluid levels and belt condition
8. Inspect intake and exhaust pre-heat control mechanism

IIA. Perform Major Tune-Up Service (Pre-requisite is: Areas of Competence #3, #6, #8)
1. Service or replace spark plugs
2. Check engine compression/leakage
3. R/R, service, and bench test distributor
4. Check dwell and adjust timing
5. Test and service battery and cables
6. Set carburetor idle mixture and speed
7. Check choke operation
   a. Fast idle
   b. Choke pull-off
8. Service air cleaner, P.C. valve, and fuel filter
9. Inspect and tighten all hose connections
10. Check and adjust belts
11. Check fluid levels
12. Inspect intake and exhaust pre-heat control mechanism
13. Test charging circuit
14. Test starter circuit
15. Check ignition with tune-up equipment
    a. Use basic meters
       (1) Ohmmeter
       (2) Ammeter
       (3) Voltmeter
       (4) Timing advance meter
       (5) R.P.M. and dwell meter
    b. Use ignition oscilloscope
    c. Use infra-red tester
17. Perform road test
18. Perform dynamometer test

IIIA. Diagnose Engine Performance
1. Diagnose mechanical conditions
   a. Troubleshoot cylinder head and valve train problems
   b. Troubleshoot block problems
   c. Troubleshoot intake manifold for leaks and pre-heat

d. Troubleshoot exhaust manifold and system for restrictions and heat riser
e. Troubleshoot emission controls

2. Diagnose electrical circuit conditions
   a. Troubleshoot cranking circuit
      (1) Test battery cables, motor control, and load circuit
      (2) Check engine related problems
   b. Troubleshoot charging circuit
      (1) Test output, settings, and circuit resistance
   c. Troubleshoot conventional and electronic ignition system
      (1) Check primary and secondary circuits
      (2) Check distributor operation
3. Diagnose fuel system conditions
   a. Test fuel pump, lines, and filters
   b. Check carburetion
      (1) Test A/F ratio
      (2) Test with infra-red tester
   c. Check evaporative controls
   d. Check emission controls
4. Perform road test
   a. Check low speed operation
   b. Check high speed operation
   c. Check acceleration
5. Perform dynamometer diagnostic performance test
   a. Check road operations
      (1) Check ignition patterns
      (2) Check A/F ratios and power circuit
      (3) Check infra-red reading
      (4) Check horsepower
      (5) Check speedometer
      (6) Check vibrations

AREA OF COMPETENCE #9

PERFORM FUEL AND EMISSION SYSTEM SERVICE

IA. Inspect Fuel and Emission Systems
1. Inspect fuel pump for mounting and leaks
2. Inspect emission system belts, hoses, and connections
3. Inspect carburetor for mounting, leaks, and linkage
4. Inspect fuel tank for leaks and dents
5. Inspect indicator gauge for operation
6. Inspect air, fuel, and carbon canister filter condition
7. Inspect manifold heat control valve for operation
8. Inspect intake manifold for leaks and mounting
9. Inspect catalytic converter for condition/operation
10. Inspect positive crankcase ventilation system
11. Inspect air pump system operation
12. Inspect heated air intake system

IIA. Remove and Replace Fuel and Emission Components
1. Test fuel pump and R/R fuel pump
2. R/R emission syster belts and hoses
3. R/R carburetor
4. R/R fuel tank (safety information)
5. R/R and test fuel gauge and sender unit
6. R/R air, fuel, and carbon canister filter
7. R/R manifold heat control valve
8. R/R intake manifold
9. R/R catalytic converter
10. R/R and test P.C.V.
11. R/R air pump
12. R/R pre-heat unit
13. R/R air injector components
14. R/R carbon canister
15. R/R and service E.G.R. system

IIIA. Rebuild Fuel and Emission Components
1. Rebuild and adjust carburetor (1, 2, 4 barrel)
2. Repair fuel tank with epoxy or liquid solder
3. Rebuild heat riser valve
4. Service catalytic converter

IVA. Diagnose Fuel and Emission Systems
1. Diagnose fuel system problems
   a. Diagnose carburetor operation
   b. Diagnose fuel pump operation
   c. Diagnose lines and filter operation
2. Diagnose exhaust system problems
   a. Restrictions
   b. Noise and leaks
3. Diagnose emission systems
   a. Operate infra-red tester and A.F.R. tester
4. Diagnose, R/R, or repair electronic fuel injection system

AREA OF COMPETENCE #10

PERFORM BODY ADJUSTMENTS AND SERVICE

IA. Inspect and Adjust Body Components
- 1. Inspect and adjust doors
  - a. Strikers and locks
  - b. Hinges
  - c. Seals
- 2. Inspect and adjust windows
- 3. Inspect and adjust hood and trunk lids
  - a. Latch and locks
  - b. Hinges and springs
  - c. Seals
- 4. Inspect and adjust seat mechanism

IIA. Remove and Replace Body Components
- 1. R/R door components
  - a. Strikers and locks
  - b. Hinges
  - c. Seals
- 2. R/R glass
  - a. Moveable
  - b. Stationary
- 3. R/R hood and trunk lids
  - a. Latch - locks
  - b. Hinges - springs
  - c. Seals
- 4. R/R seat mechanisms
  - a. Manual control
  - b. Electric control
  - c. Tracks and latch
- 5. Install accessories
  - a. Radio antenna, speakers, and tape deck
  - b. Mirrors
  - c. Trim
- 6. R/R safety devices
  - a. Seat belts
  - b. Warning systems (buzzers, lights)

IIIA. Diagnose Body Problems
- 1. Diagnose leaks
  - a. Dust
  - b. Water
  - c. Air
- 2. Diagnose noises
- 3. Diagnose radio problems
  - a. Static - noise
  - b. Antenna
  - c. Speaker

AREA OF COMPETENCE #11

PERFORM EXHAUST AND LUBRICATION SERVICE

IA. Perform Safety Inspection
1. Inspect tires and air pressure
2. Inspect shocks
3. Inspect lines and hoses
4. Inspect fluid levels
5. Inspect lights and wipers
6. Inspect warning devices
7. Inspect suspension and steering
8. Inspect drive belts
9. Inspect brake pedal reserve
10. Inspect engine mounts
11. Inspect glass
12. Inspect exhaust manifold
13. Inspect muffler/resonator and pipes
14. Inspect catalytic converter
15. Inspect clutch pedal free travel

IIA. Perform Exhaust and Lubrication Service
1. Lubricate chassis
2. Change engine oil and filter
3. Change automatic transmission fluid and filter
4. Repack wheel bearings
5. Test anti-freeze protection
6. Flush and install anti-freeze
7. Clean windows
8. Vacuum interior
9. R/R exhaust manifold and pipe
10. R/R muffler, resonator, and pipes
11. R/R catalytic converter
12. R/R exhaust heat riser

IIIA. Diagnose exhaust system
1. Diagnose exhaust system problems
   a. Restrictions
   b. Noise and leaks

AREA OF COMPETENCE #12

PERFORM RELATED SUBJECT ACTIVITIES

I. Demonstrate Prescribed (OHSA) Safe Work Practices in Each AREA OF COMPETENCE
   1. Demonstrate Shop Safety Practices
      a. Personal
      b. Co-Worker
      c. Fire
      d. Shop
      e. Equipment
      f. Tools
      g. OSHA
      h. Shop and personal appearance

II. Operate Welding Equipment
   1. Demonstrate gas procedures
   2. Demonstrate arc procedures
   3. Demonstrate soldering/brazing/cutting procedures

III. Perform Shop Related Skills
   1. Identify and select fasteners
      a. Nuts, bolts, and screws
      b. Clips, retainers, and snap rings
      c. Washers
      d. Clamps and licking devices
   2. Maintain tools
      a. Drills, bits, and cutters
      b. Chisels and punches
      c. Screwdrivers
      d. Handles
   3. Demonstrate proper use of tools
      a. Stud extraction tools
      b. Torque wrenches
      c. Tap and die (thread chasers)
         (1) Thread repair
      d. Power hand tools
      e. Cutting tools
      f. Grinders
   4. Demonstrate use of shop manuals
      a. Repair manuals
      b. Parts and Time Guide
      c. Specifications
      d. Wiring diagrams
      e. Technical bulletins

IV. Solve Automotive Math and Related Measuring Problems
   1. Solve shop-business problems
   2. Solve metric problems
   3. Demonstrate precision tool measuring

V. Perform Communication Activities
   1. Write business letters
   2. Prepare resume
   3. Perform job application procedures
      a. Application forms
      b. Interview procedures
   4. Write work orders and service reports

VI. Maintain Bookkeeping Record for a Small Business
   1. Perform basic bookkeeping procedures

VII. Perform Management and Business Procedures
   1. Estimate jobs (local and state laws)
   2. Perform sales and service selling techniques
   3. Evaluate time management
   4. Determine employee productivity
   5. Perform inventory control and security

VIII. Solve Customer and Employer Relation Problems
   1. Solve communication problems
   2. Solve attitude problems of supervisor-employee relations

IX. Participate in Union Orientation

X. Participate in Supervised Work Experience Training (Co-op or Internship)

XI. Participate in Club Activities

III. REFERENCES

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American National Standards for Training of Automotive Mechanics for Passenger Cars and Light Trucks. American National Standards Institute, 1972, ANSI D18.1-1972, 1430 Broadway, New York, New York 10018.

Automobile Mechanic Training Program Curriculum Outline. Ford Service Publications, 1973, Post Office Box 07150, Detroit, Michigan 48207.

Chilton's Labor Guide and Parts Manual. Chilton Company, 1974, Radnor, Pennsylvania 19089.

Directory of Occupational Titles, Vol. 1, 3rd Edition. United States Department of Labor, 1965, Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

Motor's Parts and Time Guide. 1974, New York, New York 10019.

National Automotive Data. Mitchell Manuals, 1974, Post Office Box 80427, San Diego, California 92138.

Program Planning Guide. McGraw-Hill, Inc., 1972, Manchester Road, Manchester, Missouri 63011.

IV. COMPETENCY RECORD

The Competency Record that appears in this section is suggested as a replacement for or supplement to the traditional report card. It can be used to give employers, teachers, counselors, students and parents information about what each student can and cannot do.

The Competency Record should follow the student through his or her vocational training in the secondary and/or the post secondary school. The recommended grading scale is shown on the COMPETENCY RECORD. The Competency Record on the following pages includes <u>all</u> the Areas of Competence need for the graduate of the Automotive Mechanic Occupational programs. However, the exploratory program requires that the student be competent in only some of the areas shown on the competency record. You may wish to designate them by shading in those competencies that you as a group choose for inclusion in your Exploratory Program. It is highly recommended that students be graded on <u>some</u> tasks within <u>each</u> of the twelve areas of competence that appear on the competency record which follows.

COMPETENCY RECORD

Occupational Programs: General Automotive Mechanic, Service Center Mechanic, Lubrication Specialist

This competency record tells what the student, who is named below, has demonstrated that he or she can do. A committee of industrial representatives from throughout Minnesota assisted in identifying the competencies needed by graduates of the occupational programs shown above. For more specific information, refer to the task list for each occupational program.

Grading:
- 5 - able to help others; very competent
- 4 - able to perform the task(s) without supervision; competent
- 3 - able to perform the task(s) with limited supervision
- 2 - able to perform the task(s) with direct supervision
- 1 - unable to perform the task(s)
- ✔ - received introduction only

Name of Student _____

SCHOOL(S) ATTENDED DATES ATTENDED INSTRUCTOR'S NAME

	Secondary Grade Year Teacher		Post Secondary Grade Year Teacher	
AREA OF COMPETENCE #1: PERFORM STEERING AND SUSPENSION SERVICE				
IA. Inspect Steering and Suspension System				
IIA. Remove and Replace Steering and Suspension Components				
IIIA. Diagnose Steering and Suspension Systems				
IB. Inspect Manual and Power Steering Systems				
IIB. Remove and Replace Manual and Power Steering System Components				
IIIB. Rebuild Manual and Power Steering Components				
IVB. Diagnose Manual and Power Steering System				
Comments				

	Secondary Grade Year Teacher			Post Secondary Grade Year Teacher		
AREA OF COMPETENCE #2: PERFORM DRIVE TRAIN SERVICE						
IA. Inspect Clutch Assembly						
IIA. Remove and Replace Clutch Components						
IIIA. Rebuild Clutch Components						
IVA. Diagnose Clutch Operation						
IB. Inspect Manual Transmission Assembly						
IIB. Remove and Replace Manual Transmission Components						
IIIB. Rebuild Manual Transmission						
IVB. Diagnose Manual Transmission Operation						
IC. Inspect Automatic Transmission Assembly						
IIC. Remove and Replace Automatic Transmission/ Components						
IIIC. Rebuild Automatic Transmissions						
IVC. Diagnose Automatic Transmission Operation						
ID. Inspect Drive Shaft Components						
IID. Remove and Replace Drive Shaft Components						
IIID. Diagnose Drive Shaft Operations						
IE. Inspect Drive Axle Assemblies						
IIE. Remove and Replace Drive Axle Components						
IIIE. Rebuild Drive Axle Components						
IVE. Diagnose Drive Axle Operation						
Comments						
AREA OF COMPETENCE #3: PERFORM ENGINE MECHANICAL SERVICE						
IA. Inspect Engine Condition						
IIA. Remove, Replace, and Inspect Engine Comp-						
IIIA. Rebuild, Measure, Assemble, and Adjust Engine Components						
IVA. Perform Final Inspection and Break-In Procedure						
Comments						

	Secondary Grade Year Teacher		Post Secondary Grade Year Teacher	
COMPETENCE AREA #4: PERFORM COOLING AND HEATING SYSTEM SERVICE				
IA. Inspect Cooling and Heating System				
IIA. Remove and Replace Cooling and Heating System Components				
IIIA. Diagnose Cooling and Heating System				
Comments				
AREA OF COMPETENCE #5: SERVICE AIR CONDITIONING SYSTEM				
IA. Inspect Air Conditioning System				
IIA. Remove and Replace Air Conditioning Components				
IIIA. Rebuild Air Conditioning Components				
IVA. Diagnose Air Conditioning System				
Comments				
AREA OF COMPETENCE #6: PERFORM BRAKE SERVICE				
IA. Inspect Drum/Disc Brake System				
IIA. Remove and Replace Brake System Components				
IIIA. Rebuild and Machine Brake Components				
IVA. Diagnose Drum/Disc Brake System				
Comments				
AREA OF COMPETENCE #7: PERFORM ELECTRICAL SERVICE				
IA. Inspect and Service Battery				
IIA. Remove and Replace Battery				
IIIA. Diagnose Battery Problems				

	Secondary Grade Year Teacher		Post Secondary Grade Year Teacher	
IB. Inspect Charging Circuit				
IIB. Remove and Replace Charging Circuit Components				
IIIB. Rebuild Charging Circuit Components				
IVB. Diagnose Generator/Alternator Charging Circuit				
IC. Inspect Cranking System				
IIC. Remove and Replace Cranking Circuit Components				
IIIC. Rebuild Cranking Circuit Components				
IVC. Diagnose Cranking Motor Circuit				
ID. Inspect Ignition System				
IID. Remove and Replace Ignition Circuit Components				
IIID. Rebuild Ignition Circuit Components				
IVD. Diagnose Ignition Circuit				
IE. Inspect Electrical Accessories				
IIE. Diagnose and Repair Electrical Accessory Circuits				
IF. Inspect and Replace Lighting System Components				
IIF. Diagnose and Repair Lighting Circuits				
Comments				
AREA OF COMPETENCE #8: PERFORM ENGINE TUNE-UP SERVICE+				
IA. Perform Minor Tune-Up Service				
IIA. Perform Major Tune-Up Service+Prerequisite for Major Tune-Up: Areas 3, 6, and 8				
IIIA. Diagnose Engine Performance				
Comments				

	Secondary Grade Year Teacher		Post Secondary Grade Year Teacher	
AREA OF COMPETENCE #9: PERFORM FUEL AND EMISSION SYSTEM SERVICE				
IA. Inspect Fuel and Emission Systems				
IIA. Remove and Replace Fuel and Emission Components				
IIIA. Rebuild Fuel and Emission Components				
IVA. Diagnose Fuel and Emission Systems				
Comments				
AREA OF COMPETENCE #10: PERFORM BODY ADJUSTMENTS AND SERVICE				
IA. Inspect and Adjust Body Components				
IIA. Remove and Replace Body Components				
IIIA. Diagnose Body Problems				
Comments				
AREA OF COMPETENCE #11: PERFORM EXHAUST AND LUBRICATION SERVICE				
IA. Perform Safety Inspection				
IIA. Perform Exhaust and Lubrication Service				
IIIA. Diagnose Exhaust System				
Comments				
AREA OF COMPETENCE #12: PERFORM RELATED SUBJECT ACTIVITIES				
I. Demonstrate Prescribed (OSHA) Safe Work Practices in Each AREA OF COMPETENCE				
II. Operate Welding Equipment				

	Secondary Grade Year Teacher	Post Secondary Grade Year Teacher
III. Perform Shop Related Skills	| |	| |
IV. Solve Automotive Math and Related Measuring Problems	| |	| |
V. Perform Communication Activities	| |	| |
VI. Maintain Bookkeeping Record of a Small Business	| |	| |
VII. Perform Management and Business Procedures	| |	| |
VIII. Solve Customer and Employer Relation Problems	| |	| |
IX. Participate in Union Orientation	| |	| |
X. Participate in Supervised Work Experience Training	| |	| |
XI. Participate in Club Activities (Co-op or Internship)	| |	| |
OTHER		
Comments		

Statements of competencies can be checked at either the secondary or post-secondary level.